

SCIENCE.

FRIDAY, FEBRUARY 12, 1886.

COMMENT AND CRITICISM.

THE CALIFORNIA TROUT (*Salmo iridea*), which inhabits a restricted geographical range on the west coast, has been extensively introduced into the streams of the eastern and middle states through the agency of the U. S. fish commission. In the spring of 1880, ten thousand eggs of this species were allotted to the Missouri fish commission. These were hatched out at the state hatchery, and the fry planted in the head waters of the Gasconade, Osage, and other streams of south-west Missouri having their sources in the clear, cold, large, flowing springs that abound in the Ozark Hills. Three thousand were planted in the head waters of Spring River, a tributary of the Arkansas. A careful inspection of the stream, made in the summer of 1885, by the commissioner of fisheries for Missouri, and others, who were familiar with the rainbow trout, showed the presence of at least three generations resulting from the original plant. The largest in size weighed between four and five pounds; those of the second size measured from fifteen to seventeen inches in length; while the immediate sources of the stream swarmed with thousands of the young trout from four to five inches in length. Accepting the indications of success thus afforded, the U. S. commissioner of fisheries is now maturing plans on an extensive scale for introducing the rainbow trout into the head waters of all the streams of Missouri, Arkansas, and the Indian Territory, which have their sources in the Ozark Hills. The area to be colonized is more extensive than the famed Adirondack region of New York, which is now the paradise of sportsmen. The streams are clear and cold, the temperature of the waters not rising above 58° F. in the heat of summer. They have every characteristic of good trout-streams, and experiment has shown their eminent adaptation to this purpose. We wonder that nature has neglected so inviting a field, yet we are informed by the state commissioner of Missouri that no native species of trout is found in any of the streams that rise in the Ozark range. The explanation will probably be found

when we know accurately the history of the development of the surface features of the interior of the continent during the post-pliocene. Be this as it may, it seems to have devolved upon the U. S. commission to enter upon and utilize nature's neglected opportunities.

LIEUTENANT DYER of the U. S. hydrographic office has compiled from the 'Monthly pilot charts' a hundred or more accounts by sailors of the use of oil to lessen the dangerous effects of the 'combing' of heavy seas during gales of wind. The hydrographic office has so far only aimed to record the experiences of mariners as reported at that office, and has not taken any decided ground as to the merits of the controversy. The mass of evidence collected is sufficient, however, to warrant the careful testing of this claim of the efficacy of oil in stilling troubled waters, and the government should at an early day detail some officer, and supply him with a vessel, that proper experiments may be made. So far as the sailors' yarns go, it appears that mineral oils are not so effective as vegetable or animal oils; and it is interesting to note that their evidence has led some of the insurance companies and steamship lines to insist upon the use of oil when occasion should require.

RELIGION IN COLLEGES is a subject at present attracting considerable interest from the attitude which Harvard has assumed regarding it. In an animated discussion between Presidents Eliot and McCosh, at the last meeting of the Nineteenth century club, the former took the view that the unsectarian college was the most useful, but by no means the only useful kind in a country with no established church and no dominant sect; while Dr. McCosh argued in favor of the retention of religion in colleges on account of both public and individual benefit. Against the sectarian institutions, said President Eliot, objection is urged first on the ground that they perpetuate class distinctions, that they foster intolerance and narrow-mindedness, and that they do not inculcate strength of character. These objections will, of course, apply strongly only to the positive class, where of all the teachers and students is required a rigid conformance with the

religious observances. The far larger number of institutions, however, occupy a position intermediate between this positive, thorough-going denominationalism and unsectarianism; and the objection brought against such is that their position is doubtful and uncertain, and their ambiguity a positive evil. The advantage of the unsectarian school, such as Harvard, is that its position is unmistakable, and a voluntary activity in religious matters is stimulated, while no attack is made on the student's faith. The officers and teachers are appointed without reference to denomination, and students are free to go to church or not. It has the disadvantage of not possessing the entire support of any denomination, and hence suffers a loss of power. It appears to be indifferent to religion, though in reality it is not. On the other hand, Dr. McCosh argued that morality could not be taught effectively in an institution without the aid of religion; that when religion is not honored in a college, agnosticism will prevail among the students; that religion gives higher aims and nobler ambitions, while its absence destroys zeal and activity. He also held that the period of college life was that in which moral and religious guidance was most needed. He knew that it was possible to retain a lively interest in religion without sacrifice of tolerance and religious freedom.

THE EXTENSION OF COPYRIGHT.

THE eighth clause of the eighth section of the constitution of the United States grants to congress the power "to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." The effort now making to revise the copyright law looks to an enlargement of the operation of this clause. Heretofore, by 'authors' the law has meant only 'citizens of the United States, or residents therein.' It is now proposed in effect to strike out this limitation, and give 'exclusive right' 'for limited times' to all authors who may comply with the conditions of the statute pertaining to copyright.

At a recent hearing before the senate committee on patents, I offered what seemed to me the simplest, most direct, and most reasonable practical solution of the problems involved in international copyright, and a careful consideration of all the plans proposed has only confirmed my confidence in the method which I outlined. This method supposes the present law, now applicable to citizens

of the United States only, to be extended to any alien who will accept the conditions under which an American author lives. The American author must enter the title of his book in the office of the librarian of congress; he must publish his book in this country, recording upon every copy the fact that he has taken out copyright; and within ten days of publication he must deposit two copies of his book in the library of congress. Then only is his title in his literary property complete.

I would ask nothing more and nothing less of the foreigner. I would require him to record his title, to publish his book here, and to deposit his two copies in the library of congress within ten days of publication, and then I would give him all the protection which the law gives to the American author. No one should be allowed to print his book except his own agent, and no copies from other countries should be allowed to come in to interfere with the edition copyrighted and published here.

Probably none of the advocates of international copyright would seriously object to this method as regards the entry of the title and the deposit of the two copies. There are some, however, who claim that the foreigner shall not have imposed upon him the condition which rests upon the native author, of publication in this country. Why not? It is said that we have been unjust to the foreign author, and that now this injustice is working the greater injury to the American author. It is to repair the wrong that we now propose an amendment of the statute. The only rational reparation is one which will put the two authors on an equality. We ask that the English author shall accept the conditions of the American author in America. We are perfectly willing to concede that the American author shall submit to the conditions of the English author in England.

This solution of the copyright problem is not more based upon theoretical fitness than it is upon practical experience. In the absence of any international legal arrangement, there has grown up of late years, between England and America, an international business arrangement. An American author to-day may secure protection for his book in England by publishing there twenty-four hours earlier than he publishes in this country. An English author may secure a quasi protection for his book on this side by publishing here at the same time as he publishes in his own country. The distinction in the two cases must be noticed. By English custom, fortified, I think, by a decision of a minor court, an American author's book which has appeared in England a day earlier than in the author's coun-

try, is so far protected that no other publisher than the one with whom the author has arranged can bring it out. There is no such law, nor even any such custom, in this country. But so great an advantage has an American publisher over his competitors, when by previous arrangement he is enabled to bring out an American edition of an English book simultaneously with its appearance abroad, that he rarely hesitates to take the risk, and he pays the English author or his representative well for this advantage of simultaneous publication.

Now, what the Englishman is doing for us under cover of a strong custom, and so far undisputed law, let us do for him under sanction of a statute; and the problem is so far solved that we may safely leave all petty details to be adjusted by the laws of trade between the two countries, and the interests of the parties chiefly concerned. Simultaneous publication, then, in the two countries, is the fairest way out of our difficulties. It is so far compulsory that it makes the best foreign thought as immediately available in America as in Europe. It compels the publisher and author not to suit their own convenience, but to study the demands of two continents; and 'the progress of science' will receive by such a course an impetus which no method, planned for the advantage of the author alone, or the publisher alone, or the people alone, can possibly give.

H. E. SCUDDER.

INTERNATIONAL COPYRIGHT.

"THE question of copyright, like most questions of civil prudence, is neither black nor white, but gray." So said Mr. Macaulay. Mr. Lowell says it is a question of robbery; the American copyright league, a question of piracy. Those who use these epithets base their assertions upon the ground that an author has a broader, more extensive right of property in his publications than in other property. That a man has property in the production of his brain which ought to be protected is admitted; but the extent of that protection must depend upon the public interest.

Scruton, in his book entitled 'Laws of literary property,' published in 1883 in London, says, "Utilitarianism is the groundwork of the science and art of legislation, and therefore the reason which justifies the enactment of any particular law is the ultimate benefit to result to the community from its conformity to such a law." This claim of property in books, as made by Mr. Lowell and the league, is of modern origin, and was not made until the early part of the last century, long after the introduction of printing, and is not recog-

nized by any civilized government. Grants in the nature of copyright were first made to printers, to encourage the multiplication of books, and were subsequently made for the benefit of the authors. In England the courts have decided that, at common law, an author had no right of property in his publications, and that whatever rights he has have been created by statute law.

Our constitution provides that congress shall have power "to promote science and the useful arts by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." The powers of congress are more limited than those of the parliament of Great Britain, which are not restricted by any constitution; and many grants which in England have been made 'for the benefit of authors,' would in this country have been unconstitutional. Every copyright is a monopoly. This proposition has been admitted by some of our authors, but denied by others who were probably ignorant of the meaning of the word. A monopoly is 'an exclusive trading privilege:' it is "the sole right or power of selling something; the full command over the sale of any thing; a grant from the sovereign to some one individual, of the sole right of making and selling some one commodity."

Every monopoly must be construed strictly, and should not be extended where reasonable doubt exists against the right. If authors limited their claims of property in the productions of their brains to the manuscript or a printed copy, no one would dispute their right to hold or lease or sell it; but they claim much more,—the monopoly of publication and selling, the exclusive right of multiplying copies everywhere and in every tongue and for all time, and they appeal to the government for aid in enforcing this right. Every nation has repudiated this claim as contrary to the interests of the public, and granted only such limited rights as it judged expedient.

General Hawley, who introduced the bill favored by the league, which gave the foreign author permission to publish abroad or in this country, realizing the weight of the objections made by the publisher and printer, that it would result in transferring the printing of all international copyrighted books to foreign countries, proposed an amendment to his bill, providing that every foreign book copyrighted in this country should be printed and published here. If the view of the league is correct, this amendment robs the foreign author of a part of his property by depriving him of the privilege of selecting the time or place of publication, or choosing his publisher. The tendency of this amendment would be to increase the cost of copyrighted books,

as the foreign edition, if made large enough to supply both countries, could be sold much cheaper here than a new edition printed in this country. It is asserted that this difficulty would be obviated by the tariff laws, as there is a duty of twenty-five per cent on books; but this is offset by duties on paper, type, ink, and other materials that enter into the composition of a book, and also by cheaper foreign labor.

There is apparently a wide-spread desire for an international copyright; but, so far as my observation extends, this wish is confined to English and American authors, or solely to parties who have a direct interest in the matter. England favors it because she will receive much greater benefit from our international copyright than America from an English international act, as ten English books are sold here for every American book sold there. A careful consideration of the whole subject will show that each country favors such legislation as is most conducive to its interest, and that the judgment of every author and publisher upon this subject is influenced, even if insensibly to himself, by the same motive. These authors and publishers are interested witnesses; and I believe there is not a single disinterested witness among those who have appeared before congress, favoring this measure.

This interest does not affect all authors alike; for some write because they cannot help writing, some for the purpose of benefiting the public, others for fame, while only a few write simply for money. Many of our old authors wrote before any copyright existed, and some of our best living authors would have written if we had no such laws. But authors cannot live on fame, and, like other workers, should be fully and amply compensated.

The copyright is of much less direct value, either to the public or authors, than is generally supposed. It is only the best authors who would suffer if we had no copyright. Mr. Holt, one of our largest publishers, states, that, out of every five publications, one is a failure; three barely pay the cost of publication; while the fifth, besides paying its cost, defrays the general expenses of the business belonging to the five books, and a profit to the publisher and author.

The indirect benefit is much greater; for the successful book is generally known to all, and incites authors to write and booksellers to publish. Special and scientific books often have few readers, and yet are of greater public benefit than more popular works. These are published in the expectation that the slow and steady sale during the life of the monopoly will pay the cost, and yield some profit and some fame to the author. How far this monopoly should be extended, and whether

foreigners should enjoy it, are questions of expediency, and not of right. Wherever such extensions will promote science and the arts, they should be granted.

The direct benefits of international copyright are much less than those from our own copyright laws, while the direct injury will be very great, as is shown by the arguments in its favor. The reasons assigned by the league, at the hearing before the senate committee for an international act are:—

First, that it would increase the price of foreign books, and stay the flood of cheap literature that now deluges the land; second, that it would increase the demand for American works, raise their price, and thereby benefit the American author.

The opinions varied in regard to the increase in the price of foreign books that would be caused by an international copyright, though all agreed that the publication of cheap editions of new books would be discontinued. I requested a bookseller of New York to prepare a list of a considerable number of choice English books, exclusive of special and scientific books and works of fiction, with the prices of the foreign edition in London and New York, and of the reprint in this country. The aggregate price of 42 books in London was \$339; of the same editions in New York, \$545.80; of the reprint, \$140.90. The average cost per copy was \$8.07 in London; \$12.90, same edition, in New York; \$3.35 for the reprint. Many of these books have been reprinted in cheap editions at from ten to twenty cents per volume. If the act proposed by the league were passed, and the books published in London and sent here for sale, the prices would be regulated by the prices in London; for, if it were considerably lower here, the books would be sent back to England for sale. If published here, either by a London or American house, the price would not much exceed the price of American books of the same class.

Mr. J. R. Lowell, on the second day of the hearing, gave it as his opinion that the price of American books would not be raised, as the increased demand, when the cheap reprints were stopped, would yield sufficient profit to the publisher at the old price.

Mr. Holt, a publisher of New York, and Mr. Estes, a bookseller of Boston, agreed that the cheap reprints had reduced the demand for American books so largely that the inducement to write was insufficient.

In answer to these statements, it was shown, that, notwithstanding the great depression in all kinds of business for two or three years, the number of copyrighted books had increased from 8,000 in 1876, to 10,000 in 1885, or twenty-five per cent

in nine years, showing the same ratio of increase with our population, and that the books copyrighted in America exceed those copyrighted in Great Britain.

These figures prove conclusively that the cheap foreign literature has increased the demand for American books by enlarging the circle of readers and cultivating a taste for reading; that an international copyright must, as all its advocates admit, increase the price of foreign books, cut off the supply of cheap literature, and thereby check the growing desire for reading; that it would therefore be a tax on knowledge, and would neither be for the interests of the people nor of the American authors, and will not promote science and the useful arts.

GARDINER G. HUBBARD.

A NEW ROUTE TO SOUTH-WESTERN CHINA.

MR. HOLT S. HALLETT'S studies and explorations have revolutionized our ideas with regard to the geography of Indo-China. It was only six years ago that Archibald Ross Colquhoun was an unknown engineer in the public works department of British Burmah. He became interested in the geography of Indo-China, and accompanied an expedition sent by the Indian government to Zimmé in northern Siam. The information gathered on that journey is embodied in his 'Amongst the Shans.' This trip only whetted his appetite for adventure, and in the winter of 1881-82 he crossed southern China from Canton to Mandalay. His intention had been to connect this exploration with that made on the Zimmé expedition. The local Chinese officials, however, placed so many obstacles in his path, that, when almost within sight of the boundary separating the Shan states from Yunnan, he was obliged to turn back and to make the best of his way to Mandalay by the comparatively well-known route *via* Tali-fu and Bamo. As he was about to lead another expedition to the Shan country, he was sent by the London *Times* as a war correspondent to Tonquin. Unable to carry out his explorations in person, he found a worthy coadjutor in Mr. Hallett, a practised surveyor, who had been for years in charge of some of the most important divisions of British Burmah. The object these two men had in view was the finding of a practicable railway-route connecting India and some British seaport with the fertile portions of south-western China.

Indo-China — as the south-eastern section of Asia, lying to the south of China proper, is now conveniently termed — is divided into three great natural divisions, — the western, drained by the

Irawaddy, Sittang, and Salwen, into the Bay of Bengal; the central, by the Meh-Kong or Cambodia River, and by the Meh-Nam, a river of Bangkok, into the Gulf of Siam; and the eastern, by the Son-tai, or Red River of Tonquin, into the Gulf of Tonquin. The valley of the Irawaddy is separated from that of the Salwen by a vast mountain-chain, while the eastern and central divisions are separated by a range or backbone running from the Tibetan plateau to the Malay peninsula. The lowest level of this latter range is in the latitude of Maulmain, a British seaport situated on the estuary of the Salwen. Now, as the most fertile portion of Yunnan is in the central division, obviously the best route for reaching it lies in crossing this great mountain-range in the latitude of Maulmain. This was the first conclusion at which the explorers arrived.

It is true that the line *via* Bamo and Tali-fu had hitherto been the favorite route. But, as Mr. Hallett points out,¹ although the distance between those two towns in a direct line is only two hundred and fifty miles, the shortest practicable route for a railway would be very nearly six hundred miles in length; and even then four passes between eight thousand and nine thousand feet above sea-level would have to be crossed.

Mr. Hallett's plan consists, then, in a railway running from Bangkok, the capital of Siam, up the Meh-Nam to its junction with the Meh-Ping; thence up the Meh-Ping by Raheng, where the line from Maulmain would come in, to a point near the confluence of the Meh-Ping and the Meh-Wung; then up the latter river, and across the water-parting between the Meh-Nam system and the Meh-Kong or Cambodia River, to the Meh-Kong at Kiang-Hsen, a town near the boundary between the Siamese and Burmese Shan states; thence over the plain bordering the Meh-Kong to Kiang-Hung, a town within fifty miles of Ssumao, a Chinese frontier town where Colquhoun was turned back.

The southern portion of this route was well known, owing in a great measure to the efforts of the American missionaries in Siam. Mr. Hallett's task, therefore, was to connect their explorations with those of Colquhoun. He carried to his work the skill of a practical engineer, and his surveys were made with such splendid precision that the cartographer of the Geographical society was able to construct an excellent map of northern Siam, which is reproduced in this number of *Science*.

Of course, there are several objections to this proposed route. It can be only indirectly con-

¹ "Exploration survey for a railway connection between India, Siam, and China" (*Proc. roy. geogr. soc.*, January, 1886).

nected with the Indian railway system by a line *via* Mandalay, the Chinwin valley, and a somewhat difficult mountain-pass. Then, again, the proposed route lies almost wholly within Siamese territory. But the government of Siam lives in great dread of French encroachments, and would probably welcome the English. At any rate, the Shans everywhere assisted Mr. Hallett, and expressed the greatest anxiety for better communications. Finally, it would tap only a portion of Yunnan, and would depend to a great extent for success on the building of railroads by Chinese themselves.

It must not be supposed that Mr. Hallett spent all his time in taking altitudes and other surveying work. He kept his eyes wide open, and has added vastly to our knowledge of the resources of Siam and of Siamese ethnology. In short, to use the words of Mr. Colquhoun, his work "has shed a bright ray of light upon a hitherto dark blot in our geographical knowledge, central Indo-China."

EDWARD CHANNING.

LONDON LETTER.

THE British association for the advancement of science will meet in Birmingham on Wednesday, Sept. 1, under the presidency of Sir William Dawson, LL.D., F.R.S., of the McGill university, Montreal. It will derive more than usual interest and importance from the exhibition of local manufactures within a radius of fifteen miles of the city, which is to be held in connection with it. The association has met thrice previously in Birmingham, — in 1838, 1849, and 1865, — and on each occasion such an exhibition was held. To the example of the first of these are due all international and other exhibitions since conducted on so large a scale.

The names of the royal commissioners on the working of the elementary education act of 1869 have just been published. The list comprises twenty-two names, all of those interested from various points of view, in the working of the act. The present government deserves great credit for the constitution of the *personnel* of the commission, which is a very strong one, all the chief religious, social, and political interests being well represented thereon. Sir John Lubbock is perhaps the strongest and most influential advocate for a place for pure science as an instrument of education, that could be found. His utterances thereon always command the respect of the house of commons and of the country. Sir Bernard Samuelson represents technical education; Mr. Samuel Rathbone (chairman of Liverpool school board), the official school board; Mr. Thomas

Heller, the body of teachers; and so on. Until this commission has reported, no legislation on the subject is likely to take place, although for a long time a feeling has been growing in the public mind that changes are necessary.

One result of the present educational system is that young persons leave the elementary schools at the ages of twelve or thirteen, and in the majority of instances go to work during the whole or a portion of the day, and scarcely ever pursue their education further. Inquiries set on foot by Canon Percival in Bristol, for example, elicited the fact that not five per cent of the children who thus leave school continue their education, in the scholastic sense of the term. To meet this difficulty, a system of evening classes has been devised, differing from such ordinary classes, inasmuch as the instruction is recreative, scientific, and practical. Attractive methods of teaching and demonstration are employed, in which the optical lantern has a large share. To Dr. Paton of Nottingham is mainly due the initiative of this movement, which was inaugurated for London at a crowded meeting held at the Mansion House on Jan. 16, presided over by the lord mayor, attended by the Princess Louise, and addressed by representatives of all shades of theological, political, and social position, from the Bishop of London and Mr. Mundella (who gave some startling figures as to the compulsory attendance on evening-schools in Germany) to representative workmen. It was stated that in London alone there were nearly half a million (420,000) young persons to whom the scheme would apply.

An important change in the matriculation examination of the University of London was, on Tuesday, Jan. 19, recommended to the senate by convocation, which, on the motion of Mr. W. L. Carpenter, B.A., B.Sc., adopted the report of a committee upon the subject. Hitherto three scientific subjects have been compulsory, — mathematics, natural philosophy (so called), and chemistry, and no alternatives were allowed. Under the proposed scheme, the 'natural philosophy' is subdivided, and a portion only is made compulsory. It is headed 'mechanics,' and the syllabus comprises those elementary but fundamental notions of statics, dynamics, etc., which are at the basis of all science. A candidate is then allowed an option between three branches of experimental science; viz., chemistry, heat and light, magnetism and electricity. Chemistry, therefore, ceases to be a compulsory subject (a change which may meet with the outcry directed some years ago against the abolition of Greek as a compulsory subject), while encouragement is given to the study of other branches of physics.

Two very wonderful engineering works have just been brought to a conclusion, both of the same character, — tunnels under rivers. The smaller, but the one of more interest to Americans probably, is that under the Mersey, between Liverpool and Birkenhead, which was opened a few days ago by the Prince of Wales. On the morning preceding the opening, trains passed from James Street station on the Liverpool side, to Hamilton Square station on the Birkenhead side, in three minutes and a half. From the spot in the centre, where the mayors of Liverpool and Birkenhead many months ago shook hands over a piece of red tape, the tunnel extends two hundred and fifty yards in each direction in a perfectly straight line. The Severn tunnel is a much more gigantic work. As the river estuary is more than two miles wide, and from seventy to eighty feet deep, the subaqueous tunnel itself, and its approaches, extend to four miles in length. It has been constructed solely by the Great western railway company, at a total cost of nearly nine million dollars (£1,750,000), and its purpose is to facilitate the transfer of coal from the South Wales coal-field to Southampton, and other places in the south and west of England. Recently coal raised at Aberdare in the morning, was shipped at Southampton (on mail steamers, etc.) in the evening. The tunnel is not yet opened for passenger traffic. The greatest difficulty in its construction; arose from the intrusion of water, not from the Severn alone, but from springs in the Pennant grit and other geological strata, two or three miles away. The source of this water, in the early days of the tunnel construction (1877-78) was first shown by the present writer.

The scientific relief fund, which is held in trust by the president and council of the Royal society, is likely to receive a very welcome addition to its resources from Sir William Armstrong. The existence of the fund dates from 1859, and is in great measure due to the exertions of the late Mr. Gasiot. The interest is applied to the relief, under certain conditions, of such scientific men or their families as may from time to time require assistance. Since January, 1861, when the first grant was made, about £4,600 have been distributed in nearly one hundred grants. The present amount of the trust is £7,000, and Sir William Armstrong is very anxious to see it raised to £20,000. He therefore proposes himself to give half the sum required, provided that the fellows, with the assistants, if necessary, of other friends of science outside of the society, will raise the remaining £6,500. Several contributions towards this end have already been promised, and it is hoped that there will be no difficulty in making up the sum

required, as the present income of the fund is by no means equal to the demands upon it. W.

London, Jan. 24.

NOTES AND NEWS.

THE recent unusual cold weather in Florida, which caused so much injury to fruit-trees, is said to have destroyed in some places large numbers of fish in the shallow waters, benumbing them, and permitting them to be cast on the beaches in windrows.

— Dr. J. W. McLaughlin, president of the Texas state microscopical society, claims to have discovered sphero-bacteria in that peculiar southern disease known as dengue, or 'break-bone' fever, and further to have isolated and cultivated them.

— It is interesting to note, that, at a recent meeting of the Royal geographical society, Admiral Sir Leopold McClintock said that "it was a companion of Major Greeley, the late lamented Lieut. Lockwood, who had made the nearest approach to the north pole yet accomplished."

— We call attention to a new map of the Congo, corrected up to October, 1885, that has just been issued by Letts, Son, & Co., of London. The topography is laid down in great detail, the scale being 45 miles to the inch.

— The German parliament has again appropriated 30,000 marks, or about \$7,500, to assist Dr. Dohrn's zoölogical institution at Naples.

— The New York *Herald* of Feb. 5 states that M. de Jousselin, commander of the steamship St. Laurent, reports observing on his last easterly voyage a magnificent aurora borealis far out on the ocean. The St. Laurent was at the time in latitude 44° 20' north, longitude 57° 3' west. The brilliant phenomenon extended from west-north-west almost to north-east, the luminous rays, white and red, mounting up to about seventy degrees above the horizon, and stars of the first magnitude were visible through the blue rays. The observations show that the aurora occurred in connection with a cloud-covered sky and in the rear of a storm which had a short time previously passed the steamer.

— The progress of psychical research has been most marked in England, but has not failed to attract attention in Germany, France, and the United States. A journal especially devoted to the historical and experimental "begründung der übersinnlichen weltanschauung auf monistischer grundlage," has been established in Germany. The journal is called *Sphinx*, and will be issued monthly by L. Fernau of Leipzig. Dr. T. U.

Hübbe-Schleiden is the editor, and associated with him are Alfred Russel Wallace, F.R.G.S., Prof. W. F. Barrett of Trinity college, Dublin, and Prof. Elliott Coues of Washington.

—Those interested in psychical research may be interested to know that the Proceedings of the American society are on sale with Cupples, Upham & Co., at thirty-five cents each.

—An international copyright law has never been defeated in either house of congress, nor has one been discussed in either since Henry Clay, in 1837, brought in the first bill of the kind. Now and then there have been hearings before congressional committees; and a favorable report was made in 1868, which was never acted on, however; and an unfavorable report, based on the narrow view of the constitutional power of congress, was later made by Senator Morrill of Maine. In the last congress the Dorsheimer bill for international copyright, pure and simple, without any conditions requiring the printing in this country of copyrighted books, was favorably reported, but congress adjourned without action. Before the present congress, there are now two bills, — one offered by Senator Hawley, similar to the Dorsheimer bill; and the other by Senator Chace, which is intended to favor the manufacturing interests.

—Prof. E. D. Cope is now engaged upon a 'Catalogue of the amphibians and reptiles of Central America and Mexico,' which is shortly to be issued. It will be the most important and complete contribution ever published on the amphibians of these two countries.

—The commerce committees of both houses of congress have decided to report favorably the bill proposing to send a commission to Mexico and South America to investigate the question of yellow-fever inoculation. Two of the members of the commission will be selected from the government service, and a third will be chosen from civil life.

—The annual report of the National academy of sciences for the past year was submitted to the senate on Monday, Feb. 8.

—The U. S. geological survey has at present but two exploring parties in the field, owing to the severity of the winter. One of these is in western Georgia, engaged in studying the southern extension of the archæan formations, under the charge of Professor Pumpelly; the other, under the direction of Mr. Garlick, is making a topographical survey of the valley of the Gila, California. Experience has shown that winter is the best time to work in this field.

—Readers of *Science*, old and new, may be in-

terested in some brief statistics concerning the paper, drawn from the editor's books. During the nearly three years since its establishment, up to January, 1886, payments of greater or less amounts have been made for contributions to the columns of the paper to four hundred and twenty-seven different persons outside the editorial office. Of course, this number would be materially increased if contributors who have not been paid were to be included in the list. The number of persons who have repeatedly furnished contributions on direct request of the editors is one hundred and forty-four. These facts furnish distinct evidence of the place that *Science* is taking in American literature, and of the breadth of the field it cultivates.

—The twenty-third bulletin of the U. S. geological survey, by Messrs. R. D. Irving and T. C. Chamberlin, treats of the relation of the Keweenaw series and the Potsdam sandstones. Geologists have held very different views concerning the relation of these beds, as the readers of *Science* will remember, from the discussion in vol. i. The writers give a clear exposition of their views, with full descriptions and history of the subject, illustrated by a number of excellent engravings. Their conclusions, briefly, are as follows. The Keweenaw series very greatly antedated, in its formation, the Potsdam sandstone, and occupied a lapse of time immensely vaster, and was a period characterized by some of the most remarkable displays of igneous activity of which the world has been a witness. They were succeeded by a long interval of erosion, before the close of which a longitudinal fault was developed along the face of the present trapezian terrane. Subsequently they were submerged beneath the Potsdam seas, and the eastern sandstone was laid down unconformably against and upon the Keweenaw series. Later, after the deposition and erosion of the Trenton, and possibly other members of the Silurian, minor faulting took place along the old break. Should these ingenious conclusions be sustained, an important change must be made in the stratigraphy of the lower Silurian. In any event, the work is to be commended for the clearness with which the facts are presented and the conclusions drawn.

—The last annual report on the vital statistics of Selma, Ala., gives some interesting facts in regard to the death-rate and disease among the whites and blacks. The population of the city is a little less than ten thousand, more than one-half of which are negroes. The death-rate from all causes for 1885 among the whites was 15.1 per thousand, while among the blacks it was 28.65. Malarial fever was three times, consumption four times, meningitis and Bright's disease, twice, as

fatal among the blacks as among the whites; while diphtheria, singularly, was three times as fatal to the whites as to the blacks.

—The New York academy of sciences announces a lecture, free to the public, at the library building of Columbia college, on March 8, by Prof. George F. Barker, on 'Radiant matter.'

LETTERS TO THE EDITOR.

**Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

International geological congress at Berlin.

I send you the following from a paper on the 'Third session of the International geological congress' (*Journ. math. phys. nat. sc.*, Lisbon), sent me by the author, Mr. Paul Choffat, one of the most important and independent members of the late congress. His strictures are only too just, and his criticisms are well worthy of attention.

After briefly sketching the incidents connected with the origin and the assembling of this congress, already familiar, M. Choffat remarks, "A goodly number of the 255 persons, representing 17 countries, came to make a scientifico-artistic visit to Berlin, or to make numerous acquaintances among their *confreres*. These must have been completely satisfied; but it is otherwise with those who came to hear treated the subjects which formed the end of the congress. These, I fancy, will unanimously agree that this end was a little neglected." He reminds his readers how important it is, and how much time it saves, to discuss questions among representatives of different countries where the answer comes at once, instead of waiting for months, or even years; and he complains that half of the afternoon sessions were devoted to scientific communications on subjects not particularly interesting to the congress, and which will be more profitable to those who read than to those who heard them. "Granting that there was an average of an hour and a half to each *seance*, in the four consecrated to debate there was a total of six hours." He complains that the report of the sessions at Zurich and Poix simply stated that a number of answers had been received, both from the national committees and from men of science acting spontaneously, but that the nature of these answers and the names of the *savants* were not given. In answer to the reproach of the international committees' report, that many national committees had not furnished the material that was expected of them, he says that the reason of this is plain, and unfortunately exists yet: it is, that the limits of the divisions have not been fixed; and, after taking the trouble to send a map made on this or that division, one is in danger of receiving it back again with the request to make another copy. In the last four *seances*, which ought to have been devoted to the discussion of questions of nomenclature, only the point of view of the map was considered. This ought to furnish those who look upon the map as simply a first edition, to serve as a basis for the discussions of future congresses, food for reflection. He thinks that the first mistake was to commence the publication of a map without settling the principles on which it should be based. He gives the following summary of the constitution of the three congresses thus far held: Paris, 194 Frenchmen and 110 foreigners, representing 20 countries; Bologna, 149 Italians and 75 foreigners,

from 16 countries; Berlin, 163 Germans and 92 foreigners, representing 17 countries. "What geologist would sacrifice his convictions to such a heterogeneous assemblage?" He thinks that not only ought the number of those voting to be much reduced, but they should not vote by countries. Instead of this, he proposes that they should vote by geological basins, and that the voters should therefore be different for every geological question raised. He concedes that it would be very difficult, if not impossible, to create such a bureau or bureaus; but he thinks that some approach to it might be made, even if voting was not permitted, but the subject was elucidated by the longest and freest discussion of each subject possible. Finally, he thinks that a great centre ought not to be chosen for the place of meeting of the congress, as the distractions are too great, and therefore he is in favor of Professor Hughes's proposition (which, however, was voted down) to hold the next session in Cambridge instead of London. M. Choffat concludes this somewhat dissatisfied commentary on the congress by acknowledging, that, "in spite of all the weak points of the three sessions of the congress, they have done much for the science of geology directly and indirectly;" and as an example of the latter influence he points to the splendid map of France, on a scale of 1:500,000, undertaken by geologists who have not any official mandate, and yet have not shrunk from the task of its publication.

Permit me to replace by my full name the first two letters of it, signed to the translation of Stelzner's letter in your issue of Jan. 22.

PERSIFOR FRAZER.

Philadelphia, Feb. 3.

Cliff-picture in Colorado.

Professor Tillman's note on a cliff-picture in Colorado (*Science*, vii. p. 80) leads me to send this account of the same object from notes made on the spot in August, 1871, and published in *Old and new*, a Boston magazine, since discontinued, in December of that year:—

The Bear Rock is a comparatively smooth face of a sandstone bluff that extends about sixty feet above the water, from which it is distant a hundred or more yards. Upon the exposed surface of the rock, about ten feet from the bottom of the cliff, is an excellent life-size representation, in profile, of a three-year-old cinnamon bear. The figure is dark brown, approaching black, being darker on the anterior half. The outline is distinct and perfect, unless exception may be taken to a slight blurring at the bottom of the hind-feet and a somewhat pronounced excess of the claws of the fore-feet. From the tail to the nose the length is about six feet, and the height at the shoulders is about three and a half feet. These are merely approximate dimensions; the writer having no facilities for exact measurement at the time of his inspection, Aug. 8, 1871. The legs are all visible, and the head points straight to the front, as if just about to take, or just having taken, a step. The fore feet are on a slightly higher plane than the hind ones, as if on rising ground. The expression is one of surprise and alarm: the head is thrust forward and slightly upward, the ears are sharply cocked forward as if on the alert, and the whole attitude displays the utmost fidelity to that of a bear in some excitement and apprehension. There is no room for a moment's doubt as to the animal, or the state of mind in which

it is. The figure is of full size, but, until scrutinized, appears smaller, being dwarfed by the magnitude of the rock on which it is depicted. . . . The Indians look upon it as great or strong 'medicine.' Beads and broken arrows are still to be found below it and in the crevices near by, apparently placed there as propitiatory offerings. Deep gashes in the subjacent sandstone show where the savages have for a long period sharpened their knives in its presence, while rudely carved, not painted, figures on the rocks are apparently the autographs or totems of individuals or bands. The popular explanation among the white settlers is, that it has been painted by the Indians. This is inconceivable by those having any intimate knowledge of them, from the utter absence of artistic skill among the savages, as shown by the almost unintelligible hieroglyphics near at hand, and from their want of familiarity with paint as durable as this pigment. The fidelity to nature of this figure is utterly beyond any ability ever known to be exhibited by them. It has been suggested that it was painted by the Spaniards, who explored this region, and described this river as Rio del Animas in what is now nearly a traditionary period. But, if a conceivable motive could be supplied, there are local reasons why no artist would place a picture just where this is found.

The surface on which it is depicted is slightly irregular and roughened, while an absolutely smooth one can be found a few feet above; and, as the existing figure is so far from the ground as to require a staging from which to be painted, the same staging could easily have been carried up the small additional height required. There is no reason why the figure should be slanting, in the absence of the accessory of sloping ground. An artist who had the skill to create this could have made a much more effective picture by giving it a somewhat different posture, or by adding a figure or two. A deep yellow stain or vein in the stone runs longitudinally through the figure, marring it as a work of art. This would have been avoided by placing it a little higher up, or it might have been obscured by the use of more color directly upon it. A small portion of the rock, where the color is deepest, was removed some time ago; and, having been carefully ground to powder, it was burned without the smell or any sensible sign of paint being elicited.

To the mind of the writer it is clear that the object is not artificial; but these details are mentioned that those who have no opportunity for personal inspection may have some basis of judgment. If this reasoning is correct, of course the figure has been placed there by some natural cause, and the most probable seems to be lightning. . . . It would appear that a bear had taken shelter under the somewhat overhanging ledge, or had simply stopped near by at the time, and, while startled at the close display of lightning, was by that agency depicted upon the solid wall. If not, what is the explanation? At places where the rock has scaled, the color shows to the depth of one-sixteenth to one-eighth of an inch, according to the closeness of its texture. White barbarians are already destroying this natural curiosity. It affords a tempting mark to passing ranchmen, and it is fast being destroyed by their well-aimed shots. Others, in sympathy with that vandalism that befouls the fairest monuments of civilization, chip off convenient projections, and pencil their little names on the fresher rock beneath. What the

superstition of the red savage has preserved, the irrational iconoclasm of his white brother destroys. The writer, since preparing this paper, has been told that a scientific party visited the Bear Rock in 1867, and attributed the picture to electricity.

The light spots in the reduced print from Captain Anderson's photograph show the scaling due to violence. The original picture, of which I have a copy, shows many bullet-marks not reproduced in the reduction. The outline of the upper part of the neck in the reduction does not closely follow the curve of the original, and the comparative coloring of the fore quarters is too intense. It is said that there is a somewhat similar picture of another animal about fifty miles farther up the Purgatoire; but this I have not seen, nor have had definitely described.

I am not prepared to defend the suggestion of electrical agency made above, and I believe scientific opinion would not accept it. But a careful study of the object *in situ*, on more than one occasion, convinces me that it is not the result of human agency, and it certainly is the accurate outline of a bear.

Dauids' Island, N.Y., Jan. 30.

ALFRED A. WOODHULL.

A scientific corps for the army and navy.

In the army, as well as in the navy, we have several corps or departments which have a greater or less claim to being called scientific. Since the earliest days in the history of our army and navy, we have also had men of the highest scientific attainments appear in the line of these two organizations. But the question may be asked now, Is not the time approaching when we should have, strictly speaking, a scientific corps for these two institutions of the public service? Their past history goes to show that every twenty or twenty-five years, either one, produces a limited number of men, who, through their writings and influence, compel us to recognize them as scientific leaders in certain lines of research, and among the ablest of those concerned in the progress of learning and the advancement of knowledge.

It is not the object of this letter, nor will the space admit of it, to refer, either by name or deed, to any of these persons. A moment's reflection on the part of any scientific man will recall to his mind whom they are, both the living and the dead, many of the works of either are imperishable. Our country does not stand alone in this matter, for we find the same applies to the military organizations of other nations. With ourselves, however, it seems to me that without any particular legislative violence, much might be accomplished whereby the country would derive a greater amount of benefit from such men, and the national credit for wise and sound legislation be considerably augmented.

The formation of a scientific corps, open to the recognized scientists of either army or navy, would remove many of the present existing disabilities that these persons have now to contend against. Then should the scientific bureaus of the government ever be grouped as a department of science, the way will be properly opened for the work of these men, and they will naturally gravitate to their proper spheres of action, without conflicting with laws that can easily be construed to send them elsewhere.

To better show the wisdom of the step proposed, and the reasons why science should recommend it for

her own sake and good name, let me lay before you one or two examples demonstrating how the disadvantages I refer to, are due entirely to existing laws, and what we would gain by the change in them. A very excellent procedure on the part of the government is now in force, which consists in sending, at stated times, a certain number of midshipmen of the navy to the Smithsonian institution. Here steps are taken to instruct them in marine zoölogy or other matters from which science may be furthered some day, as the opportunities of these young men may afford. Those only are chosen who appear to promise the most, so far as the object in view is concerned. In the long-run, and after all degrees of success of this scheme have revealed themselves, we may obtain, sooner or later, in this way, a man who is really a naturalist in every sense of the word. If I am not mistaken this has already been done, for I have sufficient acquaintance with the young man to say so. He has produced excellent work, published some creditable things, and described several new species. Now no law strictly defines the disposition that shall be made of this one success, in a hundred perhaps, but worse than this, it is more than likely that the operation of the ordinary military impedimenta will defeat, in a very short space of time, what is really a splendid investment on the part of the government. If it falls to his lot to be placed aboard of a man-of-war, under some one who has no appreciation of the importance of such things, and he makes the attempt to utilize his knowledge, it is again more than likely that he will be told that if he wishes to follow such pursuits he had better resign. This proposition is discreditable, I think, any way we look at it, for surely the navy will gain a greater degree of respect for having among their number one who shows ability in any particular line of research, and it certainly seems that the government fails in its duty in not turning such a person to the best account, to say nothing of the interest it would pay her on the original investment.

Precisely the same impedimenta constantly confront the scientific investigator in the army, and my observations upon all that such workers have to contend against in civil life, lead me to believe upon comparison, that they can never entertain any conception of the thousand and one contrivances that surround him, to defeat, and in no way further, his efforts. Not that such persons would object to any thing that the struggle for existence might impose in the natural order of things, when one grows the wiser and the better for the test, but the distractions I refer to, are exceedingly pernicious, and of a far more serious character. Say, however, an ordnance officer wins his reputation as a pathologist, and just such parallel cases have occurred, and always will occur, what happens?—why in some roundabout way we soon find him in the laboratory, but unfortunately with an order over his head directing his return to the arsenal. Now this is bad, for if he goes back to the arsenal the habit of his mind, in spite of his personal integrity, will prevent him from being a good ordnance officer, while on the other hand, the government has abundant need of efficient pathologists, and here is one perhaps whose fame is world-wide. If he be retained in the laboratory the present law demands that he *do good work by stealth*, which is very bad for the investigator, and not a creditable thing for the country, for we should be enabled to do such things entirely above board, and

be able to express our pride in them as a people, without apology, besides.

It would be superfluous in me to attempt to point out the least part of the incalculable benefit that the work of these scientists has been to their country, in the vast majority of instances, nay, to the world at large, and I must believe that the establishment of the scientific corps, that I suggest, would be a step in the right direction.

To say one of the smallest things in its favor, it would obviate the necessity of the recurrence of the ridiculous farce we were, as a nation, unavoidably guilty of, in offering Lieutenant Greely after his arduous expedition, a position in the quartermaster's department,—or such things happening, as occurred only a short time ago, an officer being reported to his department commander, because he was found guilty of pursuing lines of research foreign to his duties, and publishing the results of his investigations, notwithstanding the fact that it was proven that said duties had not been neglected in consequence.

The number of officers composing this corps should be limited to thirty, and transfers to it from other departments or the line, should be made only upon the consent of the officer. Officers should be allowed, however, to apply for such a transfer, and such application should be given due consideration by the National academy of sciences, which constitutes the highest advisory body to the government we have to decide such matters.

If the individual is found worthy of such distinction, and his work passes the required test as now applied by the academy, and he be willing, then the transfer should be effected at the earliest practicable date.

R. W. SHUFELDT.

Fort Wingate, N. Mex., Jan. 25.

Science and Lord Bacon.

A year ago the honorable Ignatius Donnelly appeared in Washington with a documentary proof that the plays of Shakspeare were written by Lord Bacon. I did not hear Mr. Donnelly's lecture, but several ladies informed me that they believed there was 'something in it.' As 'Bacon's essays' was one of the first books I bought and read, it occurred to me to examine his scientific work; but there is very little, and his single experiment appears to have been the stuffing a fowl with snow, which brought on the chill that caused his death. It seems to me that Bacon's services to science have been greatly overestimated, and that Macaulay's declamation on this point is as absurd as Mr. Basil Montague's arguments to prove that his hero never took bribes. A writer of so much intelligence as Bacon, and yet one who ridiculed the Copernican theory after the discoveries of Galileo, could have had but little scientific spirit; although it is to be remembered that the England of his day was far behind Italy and France in scientific knowledge. Can it be that in this matter we have been imposed on by the fustian of English writers, of cyclopedias and school-books?

ASAPH HALL.

The competition of convict labor.

In his reply to my criticism of his views on the convict-labor problem, Mr. Butler denies that he consciously stands on the grounds of the ruling order of political economy. He holds that his stand-point is that of 'practical ethics' (*Science*, vii. No. 157).

What is that? There are differing schools or codes of ethics both in theory and practice, and the only sense that the term 'practical' can be used in relation to ethics is that it may designate the kind of ethics in practice in the time and place in question. This in our country and time, and special field involved, is the ruling order of political economy. This is the practised one as opposed to the professed one, which is Christian, and most decidedly different from the former.

He defends this questionable position with equally questionable figures. There are no 'official' figures compiled by any such men as our practical politicians (especially in matters where they may be assumed to be interested) which any scientific man would accept as evidence to controvert the constancy of the order of nature. The assumption that contractors would hire convicts in trades which are plentifully manned by free laborers, except for the one reason, greater cheapness, involves just such an infraction in the order of nature as is expressed in the commonplace reference to water running up hill.

But even so, says Mr. Butler, the total proportion of convict labor to free is only 1.1 per cent. "And it is this minute percentage of competition that has caused all the hue and cry against convict labor."

This is a peculiarly misleading way of 'treating' the figures. The pressure of convict competition has been felt in certain trades of certain localities, such as shoe and hat making of the state of New York. There the percentage has been large enough to injure both employers and employed, and, if Mr. Butler wishes to show the causelessness of the 'hue and cry,' he ought to show the percentage in special trades and localities. A shoemaker does not compete with a tinsmith, nor does the purely local trade of one locality interfere with that of another.

It is true, however, that even the unaffected trades have taken up the 'hue and cry,' and that is because their ethics differ from the 'ruling school,' where the principle, 'every one for himself,' is held, and instead of that their ethical doctrine is, 'an injury to one is the concern of all.'

E. LANGERFELD.

Amongst a number of inferences, the above communication contains one statement, and that not bearing on the question of the general merits of the contract system, but on its application to the hat and shoe trades in the state of New York. Whether any modification of the system in this point of its application is advisable, experience must determine; perhaps a restriction as to the number of convicts to be employed in any one industry would be desirable.

The official figures as far as these two industries are concerned are as follows. In 1879, 320 convicts were employed in making hats in the state of New York, while 5,267 free workmen were engaged in the same industry; thus the competitive force of the convict labor was about 4 per cent. In 1879, 1,927 convicts — 1,885 males and 42 females — were employed in New York prisons (at Sing Sing, Auburn, and Clinton prisons, at the penitentiaries at Albany, Brooklyn, Rochester, and Blackwell's Island, and at the western house of refuge at Rochester) in the manufacture of boots and shoes. According to the census of 1880, 26,261 is the number of free laborers at boot and shoe making in New York state. This shows the competitive force of the convicts' labor in this instance to be something over 4 per cent. This amount is still small, though considerably greater

than the figure (1.1) which we found to represent the competitive force of all the convict labor in the United States, without regard to particular industries.

Your correspondent has selected that example in which competition is greatest, but even then 4 per cent is the highest figure reached, and surely it is not so very formidable. I have had some hesitation in adducing fresh figures, for fear that they may be summarily rejected as useless, because they do not fit in with some person's ideas as to how the 'course of nature' ought to go.

NICHOLAS MURRAY BUTLER.

The festoon cloud.

I have been much interested in the recent articles in *Science* on festoon clouds. In August, 1884, I witnessed a remarkable exhibition of this description over Vineyard Sound, between the shoulder of Cape Cod and Martha's Vineyard. It was in the morning, about nine or ten o'clock. The sky was overcast with clouds betokening a shower. A thunder-cloud was in the north-west, from which occasional mutterings were heard. High over the water was a dark cloud, from which depended portions of the cloud like great curtains. These depending portions grew lighter in color, and thinner in texture, until, when within about one hundred feet from the water, they frayed out into a fringe-like appearance. Between these curtains the atmosphere was comparatively clear, up to the dark cloud above; but, as the depending portions approached the dark cloud, they grew in dimension and density, forming arches from one to the other. The dark cloud extended south-west and north-east in the direction of the axis of Vineyard Sound, but the depending clouds were at right angles to this direction. I secured a sailboat, and sailed underneath these clouds, and the display was truly wonderful. The fringing of the lower portion of the depending clouds was very beautiful, and the high arches between were impressive. This exhibition was followed by a severe thunder-storm, as I remember. There seemed to be currents of air of different temperatures, but, in the absence of instruments, I was unable to make any record of this. I recall that the wind was unsteady and shifting at the surface, which required careful management of the boat.

J. M. ALLEN.

Hartford, Conn., Feb. 6.

Correction of thermometers for pressure.

Imperfect instruments, faulty methods, and personal errors have caused the introduction of a great many inaccuracies in scientific literature, and entailed great labor in their correction and the repetition of experiments. This is especially true in the case of physical constants. It is manifest that in this work of redetermination the most painstaking accuracy should be aimed at, and every possible source of error avoided. Otherwise the work must be repeated at some future day, and our theories based upon uncertain constants will have but little force.

It occurred to one of us (Dr. Venable) that a source of error in thermometric readings, not generally corrected for, might lie in the effect of pressure upon the glass bulb containing the mercury. No reference to any such corrections could be found in the books at our command, and we resorted to experiment to test the amount of the possible error.

A few experiments, carried out with some fine

Geissler thermometers, showed for a spherical bulb an increase of 0.16, and for a cylindrical bulb an increase of 0.27, of a degree Fahrenheit, for an additional atmosphere of pressure. Clearly, the amount of increase will depend upon the nature of the glass bulb, its thickness, size, and shape.

Many observations on vapor-pressure, on boiling-points under increased or diminished pressure, meteorological observations at unusually high stations or in mines, are subject to this correction; and, as no general correction will be satisfactory, each thermometer will have to be separately tested.

We have written to the signal-service bureau for information on this subject, and find that they 'have the matter under consideration,' and are making experiments. Besides, we have been referred to papers by Loewy in Proceedings of the Royal society, 1869, and by Marck, International bureau of weights and measures.

We write now to point out this source of error to readers of *Science* who may not have noticed it, and to ask if any can refer us to further memoirs and observations on the subject.

F. P. VENABLE.
J. W. GORE.

University of North Carolina, Jan. 23.

Is the dodo an extinct bird?

Since the publication of an article of mine upon the origin of birds, which appeared in the *Century magazine* for January, 1886, there have come to me a number of interesting letters questioning the fact that the dodo is entirely extinct. From among them I select one recently received from Dr. William Barr of Bovina, Miss. My correspondent tells me that he clipped not long ago, from an English newspaper, the following item: "Mr. Manley Hopkins, consul-general of Hawaii, writes to an English journal, 'By my papers received from Hawaii, I observe that among some birds brought by the schooner Fanny from the Samoan group was a single specimen of that *rara avis in terra*, the dodo. I am sure your readers will be interested to hear that this bird, supposed to have become extinct more than a century ago, still lingers in the little-explored Samoan Islands of the South Pacific.'"

A number of continental naturalists, who, no doubt, have arrived at their opinions through the rumors brought home by explorers, have predicted that the dodo will some day be found to be one of the forms of the existing avifauna of the island of Madagascar.

R. W. SHUFELDT.

Fort Wingate, N. Mex., Jan. 20.

Evidences of glacial action on the shores of Lake Superior.

Evidences of glacial action are abundant about Peninsula Harbor, on the north shore of Lake Superior. The tops of the low islands, and of the hills along the shore, are rounded in a striking manner. Below the surface of the water well-preserved grooves and scratches extend in a general north-east and south-west direction. The crevices in the granite rock which extend across the glacial markings have their northerly sides nearly intact, while the sides opposite are considerably worn. Where the crevice extends in about the same direction as the glacial mark, both of its sides are gouged out.

On Verte Island, Nipigon Bay, Lake Superior, a well-preserved beach of water-worn pebbles lies, as near as could be determined by rough measurement, two hundred and eighty feet above the present level of the bay.

A. A. CROZIER.

Grand Rapids, Mich., Jan. 26.

Professor Newcomb's address before the American society for psychical research.

In view of the utterances in the last two numbers of *Science*, called forth by my address before the American society for psychical research, some comment by me may not be inappropriate.

Of the two criticisms upon my address, which are put forth in the comments of Jan. 22, one seems to me well founded. It is that directed against my definition of thought-transference as something which is supposed to take place without any physical connection between the acting and the percipient minds. *Science* correctly points out that the absence of a physical medium of transfer is not implied in the doctrine of transference. But, while conceding this, I wish to point out that this error no more affects my conclusions than a typographical error would. The point to which my whole discourse was actually directed was that of thought-transference through any hitherto unrecognized channel, whether material or not. In other words, I inquired whether the observed phenomena required the admission of any new law of nature in order to explain them.

Your other criticism is in these words: "He places much emphasis, for instance, on the extreme rarity of thought-transference in the ordinary course of life, and implies, somewhat sarcastically, that it ought to be much more frequent."

I can find in my written paper no justification for any such remark, and cannot even guess what passage it refers to. I did, indeed, point out the well-known and obvious fact that very rare phenomena become frequent when we learn how they are produced, or how they may be observed, and remarked, that, were thought-transference real, we should expect to learn how to produce it at pleasure as its conditions became better known. The great fact which I pointed out is this: after three years of painstaking labor by the English society, and one year of our own, no one shows us how to produce or observe thought-transference, nor indeed tells us any thing about it that we did not know before.

Professor James's remarks in *Science* of Feb. 5, are directed mainly to certain reflections upon the English society, for which I am not responsible to any further extent than as having made the remark which led to them. At the same time the question seems to me not devoid of interest. The ground which I take is, that the parts of the reproduced figures made by blindfolded percipients fit together in a way which could scarcely have been possible unless the percipient either saw the drawing he was making or had a knowledge of his work by some agency unknown to science. Professor James is not ready to concede this, but apparently claims that the muscular sense would have proved a sufficient guide, and suggests that I try the experiment myself. I beg leave to assure him that I did not venture on my conclusions until I had tried it. I cannot make any such drawings as those given on pp. 89 and 95 of the Proceedings of the English society by the muscular

sense. I should be interested to know from Professor James, whose superior knowledge of this subject I of course recognize, if others can do better, and if any blindfolded draughtsman at his command can make consecutively four such pictures as those on p. 95 with entire success, or can draw five lines out of six through the angles of an invisible hexagon as accurately as is done on p. 89. If so, my remark has no particular point. If not so, but if it be considered that the draughtsman must have seen the picture as he was drawing it, then the fact will be more valuable for what it suggests than for what it proves. It will suggest the question why the committee who conducted the experiments laid such stress on the percipient being blindfolded when he could in fact see.

S. NEWCOMB.

Sea-level and ocean-currents.

One has so little practice in differing from Professor Ferrel that it is difficult to know how to begin; but there are some points in his recent letter on 'Sea-level and ocean-currents' (*Science*, Jan. 22) that do not carry conviction. The first is, that the small head of water resulting from the superficial difference in temperature of the ocean in high and low latitudes should be as effective as he claims it to be in producing ocean-currents, and especially in producing the existing surface currents whose circuits seem to be so nearly completed without descending to great depths; for the supposition that there is a gradual rising-up of deep water at the equator in any thing like sufficient volume to feed the currents that flow thence towards the poles is not warranted by the known distribution of surface or deep-water temperatures. Professor Ferrel ascribes the origin of the southward return current from France past the African islands to an elevation of the sea-level on the western coast of Europe, where it is heaped up by the eastward pressure of the North Atlantic drift; but the homologue of this current in the South Atlantic is a well-marked stream that turns towards the equator, although it finds no land-barrier to its eastward passage beyond the Cape of Good Hope. According to the convectional theory, it is not needed at the equator, for the water that it supplies to the Gulf of Guinea ought to rise there from the abysses: it seems preferable to refer it to the winds, with which it accords very well, provided there is reason for thinking that the winds could carry it.

The effect of the winds seems to be visible in changing the direction of the currents in the Indian Ocean with the changes of the monsoons, and in altering the area of the counter-current of the equatorial Atlantic as the position of the trade-winds shifts with the seasons. A brief examination of Strachan's charts of the 'Currents and surface temperature of the North Atlantic Ocean,' published by the British meteorological committee, 1872, shows the mean velocity of the return current between Portugal and the Azores (latitude $37^{\circ}.5$ to 40°) to be seventeen miles a day in the four cold months, and only nine miles for the hot months. The winter average is based on forty-one determinations; the summer average, on ninety-eight.

The sufficiency of prevailing winds to establish deep currents has been discussed by Zöppritz, with results that are approved so far as I have read. His paper on 'Hydrodynamic problems in reference to ocean-currents' (Wiedemann's *Annalen*, iii., 1878,

582) furnishes a basis for the following statements. If an ocean of great depth acquire a certain velocity of motion at the surface, it will take 239 years to gain half this velocity at a depth of 100 metres; at the same depth, even a tenth of the surface velocity will not be reached for 41 years; at a depth of ten metres the times will be 2.39 and 0.41 years. But, given sufficient time, the effect of a continuous horizontal surface motion will be felt to the bottom, the velocity finally attainable decreasing with the increase of depth. From this it appears that the effect of any variations from the prevailing forces (winds) applied at the surface will be propagated downwards very slowly, and that below a very moderate depth the motion of the greater mass of the current will depend on the mean direction and velocity of motion in the surface water. To establish the currents as they now exist would require something like 100,000 years (pp. 598, 601, 607). According to Zöppritz, therefore, we should not expect to find significant changes of level in Lake Ontario as a result of our frequently shifting easterly and westerly winds; nor in the Atlantic, on account of the difference in the velocity of the wind, winter and summer. The attitude of the greater mass of water must be in both cases adjusted to the action of the mean annual winds. In view of these and other reasons, it does not seem probable that the 'strongest winds have no sensible effect' on the ocean-level and the ocean-currents. Doubtless both gravitative convection and wind friction have a share in causing the surface currents, but the latter has the larger.

W. M. DAVIS.

Cambridge, Jan. 31.

Association of sound and color.

A friend who is peculiarly sensitive to music tells me that in listening to an orchestra he invariably sees a brilliant yellow star when the triangle is struck, and a bluish green circle (hollow) at the clash of the cymbals. As I understand him, these appear instantaneously, and then fade out little by little. I should be glad to know whether any of the readers of *Science* have similar experiences.

BRADFORD TORREY.

Boston, Feb. 9.

Tadpoles in winter.

In response to the inquiry of H. M. Hill in *Science*, vii. No. 157, I would say that for the last ten years we have been able to get tadpoles in the small streams on the Ithaca flats just before they were covered with ice in the autumn, and as soon as the ice had disappeared in the spring. There has been no trouble in keeping them alive in an aquarium in the laboratory through the winter. Those so kept have transformed, and have proved to be tadpoles of *Rana catesbiana*, the common bullfrog.

S. H. GAGE.

Anat. lab. Cornell university, Feb. 8.

In the frozen marshes surrounding Fresh Pond, Cambridge, I saw a large number of tadpoles under the ice, and in the clear water around the edges, about the last of January. The weather for a few days previous had been very warm for winter, but this had been preceded by very cold weather. I had always supposed, as your correspondent, Mr. Hill, does, that they were only found in warm weather, and I was considerably puzzled.

WM. A. FORD.

Boston, Feb. 9.

SCIENCE.—SUPPLEMENT.

FRIDAY, FEBRUARY 12, 1886.

PRIMITIVE MARRIAGE.

PROF. W. ROBERTSON SMITH, in his 'Kinship and marriage in early Arabia' (Cambridge, *University press*, 1885), may be regarded as having given the latest contribution to the controversy going on between those who uphold the opinions of the late Lewis H. Morgan in regard to the origin of human society and the primitive form of marriage, and those who support the views of the late John F. McLennan upon these subjects. To explain fully in what these differences consist would require too much space, so that we must content ourselves with stating some of the main points of disagreement.

Mr. Morgan, in his 'Ancient society,' maintained that the primitive family, which succeeded to a condition of promiscuous intercourse, was a consanguine one, founded on the intermarriage of brothers and sisters in a group. This was followed by the Punaluan or Hawaiian family, in which several sisters or brothers had groups of husbands or wives in common, who were not necessarily of kin. From this sprung the Malayan system of relationship, in which all blood-relations fall under the heads either of parent and child, of grandparent and grandchild, or of brother and sister. Besides these, the relations by marriage were also recognized. In course of time a second system of relationship grew up, the Turanian, and the form found on this continent, to which he has given the name of the Ganowanian. This second system was based upon Punaluan marriage, accompanied by a division of the tribe into gentes. The gens comprised all those who have sprung from the same mother, and intermarriage in it was prohibited. The Turanian system of relationship included, in addition to the terms used in the Malayan, also words for uncle, aunt, nephew, niece, and cousin; and it recognized also the connections by marriage. The Malayan and the Turanian systems are called by Morgan classificatory, as distinguished from that in use among ourselves, which he calls the descriptive system.

Mr. McLennan, on the other hand, in his 'Primitive marriage,' criticised this view of the origin of the classificatory systems very severely as 'utterly unscientific,' and argued that such a system cannot be one of blood-ties at all, but that it is merely

a mode of addressing persons. In it the terms 'son' and 'daughter' do not imply descent from the same mother or father, and the relationship of the child to its mother is completely ignored. The phenomena presented by such a system he undertook to explain as having originated from what he believed to be the oldest form of marriage, that of Nair polyandry, by which several unrelated men have a wife in common. This custom arose from the practice, in the earliest times, of female infanticide on account of the difficulty of subsistence. Thus a scarcity of women was occasioned, from which originated the general habit of procuring wives by capture from neighboring hostile tribes. From this custom sprung the usage of exogamy, by which intermarriage within the tribe was prohibited. Under Nair polyandry the only idea of blood-relationship conceivable would be through females, as the uncertainty of fatherhood would prevent the acknowledgment of kinship through males. Gradually there was developed a higher form of polyandry, the Thibetan, by which several brothers have a wife in common. The recognition of kinship through males having thus become possible, an explanation of the terms used in the classificatory system is not far to seek.

To this criticism and explanation Mr. Morgan replied by denying the general prevalence of either Nair or Thibetan polygamy, or of exogamy as a tribal custom, which he insisted was restricted to the gentes within the tribe. He argued, that, in the archaic form of the gens, descent was limited to the female line, and that this is what is really meant by McLennan's 'kinship through females only;' and he insisted that McLennan's hypothesis is utterly insufficient to account for the origin of the classificatory system, while ridiculing the idea that this could be a system of addresses instead of a system of consanguinity and affinity.

The discussion was now taken up by Messrs. Fison and Howitt in 'Kamilaroi and Kurnai,' a work upon the organization and primitive marriage customs of certain Australian tribes, and in a review of 'Primitive marriage' by Mr. Fison, in the *Popular science monthly* for June, 1880; in both of which Morgan's views were stoutly and elaborately maintained.

Shortly after, Mr. John McLennan having died, his brother Donald continued the discussion, on his side, by a review of 'Kamilaroi and Kurnai' in *Nature*, April 21, 1881, in which he attempted to refute Mr. Fison's objections to his brother's opin-

ions, and endeavored to prove that the former's views were based upon incorrect information. The argument was continued by his publication last year of a supplementary volume, based upon his late brother's papers, entitled 'The patriarchal theory,' written in opposition to the views upon this subject of Sir Henry Maine. In the preface he states that his brother had intended to present in greater detail the proofs of his theory of the origin of exogamy. He believed that it grew out of the system called 'totemism,' which had been outlined by him in three essays on 'The worship of animals and plants,' published in the *Fortnightly review* in 1869-70. From totemism came exogamy, arising from the scarcity of women; and this must have originated in societies acknowledging no kinship except through women. From this condition there has been a gradual progress by evolution, with varying degrees of rapidity among different people, but involving the recognition of kinship through males. As bearing upon the question of the scarcity of women, the late Mr. McLennan had already made a large collection of instances of the prevalence of infanticide and kindred practices.

Such being the present state of the controversy, as we said at the outset, the volume now before us, upon 'Kinship and marriage in early Arabia,' must be regarded as the last contribution to it. It upholds in the most uncompromising fashion the McLennan side. The learned author of the celebrated lectures upon 'The Old Testament and the Jewish Church' and upon 'The prophets of Israel,' in the discharge of his duties as lord-almoner's professor of Arabic in the University of Cambridge, had occasion to study thoroughly the laws of marriage and of tribal organization which prevailed in Arabia at the time of Mohammed. He became fully satisfied that the system of male kinship there had been preceded by one of kinship through women only, and that changes in the tribal system went hand in hand with the change in the system of kinship. He is also convinced that the correspondence of the Arabian facts with this general theory proves that the system of totemism and the law of exogamy once prevailed among the Arabs, and that the general principles of the hypothesis laid down by McLennan in 'Primitive marriage' cannot be shaken. The results thus derived he believes have "a very important bearing on the most fundamental problems of Arabian history, and on the genesis of Islam itself." All who are interested in the history of the early institutions of mankind must welcome such a learned and novel explanation of the primitive type of Semitic religion, and of the consequences that have flowed from it.

The opinion has generally prevailed that the deities of the primitive tribes must be identified with the heavenly bodies; but our author proves that this was not the earliest form of tribal religion. The Arabs retained a tribal constitution longer than the other Semites, and we know much more about it than about that of any other tribe. In its primitive form it was a totem tribe; that is, one in which the belief that all its members are of one blood was associated with the religious conviction that the life of the tribe was in some mysterious way derived from some animal or plant. "There is reason to think," he remarks, "that in early times totem tribesmen generally bore on their bodies a mark of their totem, and that this is the true explanation not only of tattooing, but of the many strange deformations of the teeth, skull, and the like, which savages inflict on themselves and their children" (p. 187). So he would explain the 'mark' set on Cain by Jehovah as "the tribal mark, which every man bore on his person, and without which the ancient form of blood-feud, as the affair of the whole stock, however scattered, and not of near relatives alone, could hardly have been worked" (p. 216). The most important evidence of the feeling, involved in the totem religion, that a man's totem animal is of one race with himself, is derived from the doctrine of forbidden foods. "A prohibition to eat the flesh of an animal of a certain species, that has its ground, not in natural loathing, but in religious horror and reverence, implies that something divine is ascribed to every animal of the species. And what seems to us to be natural loathing often turns out, in the case of primitive peoples, to be based on a religious *taboo*, and to have its origin, not in feelings of contemptuous disgust, but of reverential dread. . . . Unclean animals, whom it was pollution to eat, were simply holy animals" (p. 307). Many of their most ancient tribal names are taken from animals, of which our author gives an explanatory list of more than thirty. Such names the genealogists usually seek to explain as derived from an eponymous ancestor. But the history of paternity among the Arabs makes it clear that ancient stock-names were not derived from fathers; for the system of stocks was in existence, and they must have had names, long before the idea of fatherhood had been developed.

Three forms of marriage were known among the Arabs in antiquity: *Mot'a marriage*, which was a temporary arrangement for a fixed time; *Beena marriage*, a development of the system of Nair polyandry, where the husband settled among the wife's kindred; and *Baal marriage*, which was probably unknown before the Semitic dispersion, in which the husband took the wife to his own home,

becoming her 'lord and master.' The first kind was common at the time of Mohammed, and was with difficulty, if at all, abolished by him. Under it, as well as under Beena marriage, kinship could have been reckoned only through females. Before Baal marriage was established, a kind of Thibetan polyandry had prevailed, which he calls Baal polyandry, in which the husbands were all of one stock. From this arose the habit of acknowledging kinship through males. This Baal polyandry had grown out of the custom of marriage by capture, which was older than that of marriage by purchase, and continued after the latter custom had sprung up. In Baal marriage, of course, whether constituted by capture or by contract, the children would be regarded as belonging to the blood of the father.

We regret that we cannot allude to many other important subjects, especially that of the prohibited degrees, from which useful light may be derived upon the problems of early kinship, as well as to numerous excursions in the notes upon interesting archeological topics. We can only refer general students of early society, as well as all who are interested in old Arabia, to this valuable work, which, having been expanded and rewritten from a course of university lectures delivered in 1885, contains the last word in the important controversy of which we have attempted to sketch the outline.

H. W. H.

THE OIL-WELLS OF BAKU.

BAKU is a seaport town of the Apsheron peninsula, in the Caspian Sea, in the most southern part of the Russian territory. The adjacent region has long attracted the attention of the surrounding nations, on account of the naphtha with which the soil is impregnated. The inflammable gases issuing from the ground rendered the locality sacred in the eyes of the Parsees, or fire-worshippers, who have long resorted to it from distant places. The peninsula is an arid waste; and one of the most serious difficulties encountered is the scarcity of water, both for mechanical and dietetic uses. The centre of the oil-industry, according to F. Vasilieff, as given in the Proceedings of the Institution of civil engineers, does not exceed four and a half square miles in area, which forms, indeed, the centre of the whole oil-bearing region of the Caucasus.

The earliest oil-wells date back for centuries. A Persian inscription has been found which fixes the date of one of them at 1594. After the cession of the country to the Russians in 1813, the oil-industry was under the control of the government, and up to 1873 the entire revenue derived

from this source did not exceed fifty thousand dollars. The manufacture of kerosene commenced in 1858, after which the industry began to develop slowly; but within the last fifteen years it has increased with greater activity. At that time land was sold at auction, and brought as high as five thousand dollars per acre. The old crude methods and shallow wells were abandoned, and at present there are more than five hundred borings. The yield has now reached a million tons per annum.

The naphtha-bearing strata, three of which are so far known, belong to the lower miocene formation. They dip at an angle of from 20° to 40°, and are composed of sand, calcareous clays, marls, and in places compact sandstone, often of great thickness. Organic remains are wholly absent. The naphtha-bearing sands are in a semi-fluid condition, and, when brought to the surface, give off carburetted-hydrogen gas. Not only do these sands give much trouble, but the salt water associated with them makes the driving of bore-wells difficult.

The plateau is a hundred and forty feet above the surface of the Caspian Sea, and the bores reach as deep as six or seven hundred feet. The depth, however, depends upon the yield and the quality of the oil. At first the oil does not reach high in the borings; but, as the depth increases, it rises, and at last is forced out by the pent-up gases.

A naphtha-fountain differs very much from one of water. The oil, on leaving the pipe, is broken up into many jets, which scatter in all directions. The larger part, on account of the liberation of the occluded gases, is shattered into the finest spray. Together with the oil, there is ejected an immense quantity of sand, stones, lumps of clay, some of the pieces being very large. This condition of things is explained by the high pressure of the gases, which has been measured in closed bore-pipes, and found to range between fifty and three hundred pounds per square inch. In the year 1883 two fountains played simultaneously to a height of between two hundred and fifty and three hundred and fifty feet. When a fountain breaks out, the boarding of the boring-turret is soon torn off, stones are thrown up to a great height, and it is dangerous to approach the bore, especially from the circumstance that the naphtha spray has an inebriating effect on the workmen. A cloud of naphtha hovers over the fountain, and is carried to great distances by the winds, covering every thing it passes over with a light film of oil. The sand thrown up forms a hillock round the well, often rising to twenty-eight feet in height. The bursting-forth of a fountain is accompanied by loud noises and a trembling of the earth. Millions

of tons of oil have been lost from an inability to direct it into reservoirs, which are frequently not even prepared before the need of them arises. Some fountains are intermittent, and play from one to two or three hours at a time, and then cease for a day or so. These are the most convenient, as they give plenty of time to arrange for collecting the oil. In some cases the action has to be started by withdrawing a few scoops of oil from the bore, and thus disturbing the subterranean equilibrium.

Continuous fountains sooner or later become intermittent, and then, like the latter, settle down into ordinary wells, from which the oil must be raised by the usual methods. The jet sent out of a bore-pipe appears urged forward by a rapid succession of pulsations; but periods of quiet may be noted, during which the fountain seems to gather up its strength for an extra energetic effort. The height of the jet varies with the intensity of the pulsations. A continuous fountain may yield over thirty-three hundred tons of oil, and require the labor of a hundred men to collect and store it in reservoirs. The daily yield would be worth five hundred dollars, the cost of labor being from seventy-five to a hundred dollars.

The condition of the oil is such, that, when no longer forced out by internal agencies, it must be removed from the bores by means of scoops: hence the bore-holes have to be large, usually sixteen inches in diameter, and, having to be maintained at that diameter throughout, must be lined with bore-pipes. The cost of these bore-pipes is a serious item, in a well of six hundred feet in depth costing twenty-five hundred dollars, while the expense of sinking the bore amounts to about five thousand dollars.

The owners of allotments are free to sink their bore-holes where they like: hence they are mostly sunk along the boundaries of the plots, and not at the points which the lay of the strata would indicate to be the most advantageous. The reason for this is, that each proprietor considers, that by sinking a bore near his neighbor's plot, if he succeed, he will get his own oil and a good deal of his neighbor's also. His neighbor is actuated by the same motives: hence the allotments have the appearance of fortified places, being surrounded by works, and unoccupied over the greater portion of their inner areas. Naturally, if a bore be exceptionally successful, a large number of additional ones are at once driven, and the yield of each is in consequence reduced.

The mean produce of the one hundred wells now in action is given at thirty-two tons per well per day, from March to November. The average cost of production is about twelve dollars per ton, nearly

five per cent of which is due to the scarcity of water.

A commission appointed by the government reports that a pipe-line from Baku to Batoum on the Black Sea is indispensable for the higher development of this industry, as at present not one-half of the valuable products are obtainable. The commission, however, thinks that the undertaking should be left to private enterprise. The Transcaucasian railway will in a measure aid in the transportation.

RATIO OF INCREASE OF HEIGHT TO INCREASE OF BULK IN THE CHILD.

SOME remarkable observations, we learn from the *Lancet*, have been recently made by the Rev. Malling Hansen, principal of the Danish institution for the deaf and dumb, on the progressive increase in height and weight of children, one hundred and thirty of whom were under his charge. Of these, seventy-two were boys and fifty-eight girls, and they were weighed in batches of twenty, four times daily, — in the morning, before dinner, after dinner, and at bed-time. Each child was measured once a day. The weighings and measurements extended over a period of three years, and the results showed that the increase in the bulk and height of the body does not proceed at a uniform rate throughout the year. Three distinct periods, with some minor variations, were observed. In regard to bulk, the maximum period extends from August until December; the period of equipoise lasts from December until about the middle of April; and then follows the minimum period until August. In regard to height, the maximum period corresponds to the minimum period of increase in bulk. In September and October a child grows only a fifth of what it did in June and July. So it appears that during the autumn and the beginning of winter the child accumulates bulk, but the height is stationary. In the early summer, on the other hand, the bulk remains nearly unchanged, but the vital force and nourishment are expended to the benefit of height. When the body works for bulk, there is rest for growth, and *vice versa*. Mr. Hansen has observed a similar ratio of increase of bulk to increase of height in trees. In regard to the minor variations observed, it is probable that they are dependent, in part at least, upon the external temperature; so that, when this runs up, there is marked increase in weight, while a diminution of weight occurs with a fall of temperature.

Mr. Hansen's observations are undoubtedly of considerable importance. Similar ones have been

made by Dr. W. R. Miller, surgeon to the West Riding convict prison. Dr. Miller experimented on about four thousand prisoners for thirteen years, and obtained results that differ sensibly from those of Mr. Hansen; for he found that the season of maximum increase in weight in adults is from April to August, and the period of minimum increase in adults from September to March. Dr. Miller found the body became heavier in summer, and lighter in winter; and he attributes the loss of weight to the more active excretion of carbonic-acid gas in the colder months.

DIFFERENT PHYSIOLOGICAL SENSES FOR HEAT AND COLD.

IN connection with the researches of Professor Hall and Dr. Donaldson of Johns Hopkins university, recently given in *Mind*, it will be of interest to state that Mr. A. Herzen has lately published in the *Archiv für physiologie*¹ the results of a series of experiments showing that the physiological sense of cold is different from that of heat. His attention was first directed to the subject by a simple incident, the verification of which may be readily made by any observer. Awakening one night, he found one of his arms lying without the bed-clothes, 'alseep;' in touching it with the other hand, he perceived a distinct sensibility to warmth, while that of touch was gone. Bringing his arm, however, in contact with cold substances, he was surprised to find no sensation.

Pursuing the subject further, he produced artificially this condition of semi-paralysis by the compression of nerve-trunks, and by experimentation discovered that the sensibility to cold remained a short time after tactile impressions had disappeared, and that the sensibility to warmth remained much longer, but not quite as long as the power of detecting pain; also that the impressions of warmth require more time for transmission to the brain than those of cold, bearing, in fact, the same relations to each other as the sense of pain does to that of cold. These results were further supplemented by observations on a person with complete and permanent tactile anaesthesia of the legs, but in whom the sense of pain remained normal. The subject was able to distinguish quite well the differences in temperature between 150° F. and 81° F., which was the normal temperature of the surface of the leg. Below the latter temperature, however, no sensation was produced, not even by the contact of ice on the inner side of the thigh. Other cases showed the same peculiarities, in which,

with the disappearance of tactile sensibility, the susceptibility to cold was also lost, while that to warmth yet remained.

Vivisection experiments upon cats and dogs lead the author to the following conclusions: 1. The so-called sense of heat and cold is composed in reality of two senses quite independent both anatomically and physiologically; 2. Observations on healthy and diseased subjects show that the sensations of heat and cold are transmitted through different nerves, by different routes, and to different brain-centres; 3. The gyrus sigmoides contains the centre (or the centripetal branches leading thereto) of touch and cold perceptions; 4. These sense-perceptions are transmitted through the posterior columns of the spinal cord, while those of the senses of pain and warmth are conveyed through the gray substance.

Although the senses of cold and touch on the one hand, and heat and pain on the other, seem to be more nearly related, yet one cannot unite them, or consider the different perceptibilities of heat and cold mere modifications of those of touch and heat. The researches of Blix and others have demonstrated the existence of separated, isolated, irregularly distributed points upon the body, of which one may be only sensible to cold, another to warmth, and a third to touch. Doubtless most persons have noticed the different degrees of susceptibility of different parts of the body to heat and cold: the author points out striking examples of such.

RAINFALL IN SOUTH AFRICA.¹

LITTLE has been known until recently on the subject of rainfall in South Africa, taken broadly over the whole country, although observers have for many years been keeping records at isolated stations. There has been for many years a meteorological commission in existence at Cape Town; and in the report for 1883 an interesting table was published, giving the means, monthly and yearly, at all stations where records have been kept for at least five years, with the altitude above sea-level, and the latitude and longitude for each station.

From these data Mr. Tripp has prepared a map of South Africa, with the idea of showing the distribution of the total yearly rainfall. The curves divide the area into districts, where the mean yearly rainfall is—

(1) Under	5 inches.	
(2) From	5 "	to 10 inches.
(3) " "	10 "	" 20 "
(4) " "	20 "	" 30 "
(5) Above	30 "	

There are doubtless, particularly along the moun-

¹ *Ueber die spaltung des temperatursinnes in zwei gesonderte sinne*, xxxviii. p. 93, December, 1885.

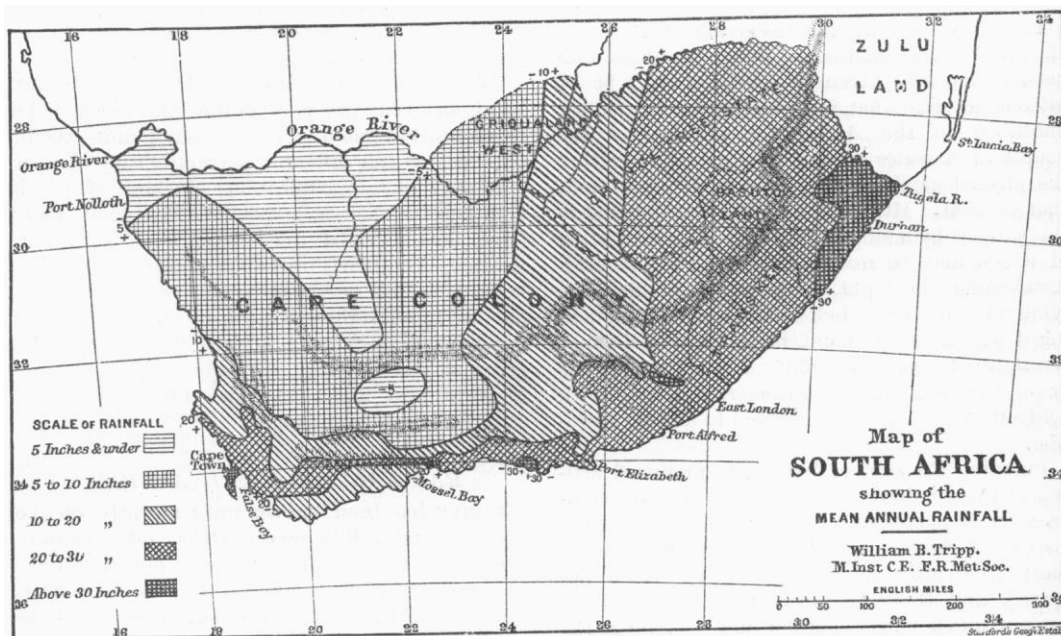
¹ Abstract of an article by William B. Tripp, in *Symons's meteorological magazine*.

tain ranges, many wet strips and spots where no definite records are kept, and which therefore cannot at present be shown on the map. Multiplication of records, as well as general local knowledge, will, no doubt, reveal many such places.

South Africa may be described as a central tableland, rising in successive terraces from the seacoast. The country has been subject to great erosion from water; and the mountains with which the country is studded, and the deep valleys, locally termed 'kloofs,' with which it is intersected, are principally due to this cause. In some cases the hills are covered with forests, but generally they are now denuded of such covering. Where the streams take their rise in an area de-

winter half of the year from April to September, than in the summer half from October to March; May, June, and July being the wettest months, and the north-west the general rain-bearing wind. On the eastern side, however, the fall is greater in the summer half, March and February being the wettest months, and the south-east the rain-bearing wind. On the south-east coast the dividing-line between these two different characteristics appears to run out to sea very nearly at Port Alfred, where the fall in both halves of the year appears to be very nearly identical, that in the summer half being rather the greater of the two.

Mr. Tripp resided and kept records for some



denuded of forest, their volumes are highly variable, their beds being dry for, in some cases, three hundred days in the year; their only existence being, in fact, as torrents after sudden thunder-storms. When, however, it fortunately happens that the streams take their rise in an area still largely clothed with forests, they are frequently perennial.

The climate over such a large tract of country as South Africa varies, of course, considerably. The rainfall varies from 2 inches to 50 or 60 inches doubtless, and perhaps more in some of the mountain districts: in the north-west corner of Natal it is considerably over 30 inches. Dividing the country according to the half-yearly distribution of rainfall, we find that on the western and southern sides the fall is generally greater in the

years at King William's Town, in the eastern province, where, on a total of 283 days, from June, 1880, to May, 1883, 70 inches of rain were registered, 30.25 inches of which (recorded on 242 days) were made up of falls under 0.50 of an inch, 19.88 inches (on 28 days) from 0.50 of an inch to 1 inch, and 19.87 inches (on 13 days) of falls of from 1 inch or upwards, in twenty-four hours. The heaviest fall on any one day was 2.04 inches, and the next heaviest fall was 3.11 inches, in forty-eight hours.

Although this record proves that the rains are moderate and tolerably distributed, and do not all occur in sudden storms, yet the author has heard accounts of sudden falls there of a very different character, and most disastrous in their results.

FACSIMILE OF THE ANTILEGOMENA.

THE Johns Hopkins publication agency announces a reproduction in phototype of seventeen pages of a Syriac manuscript containing the epistles known as 'Antilegomena.' These are to be published under the editorial supervision of Prof. Isaac H. Hall, Ph.D., with brief descriptive notes by the editor. This manuscript consists of the Acts and Catholic epistles, and the Pauline epistles, followed by Hebrews; together with tables to find Easter, etc. (arranged for the Seleucid era), tables of ecclesiastical lessons, and a poem at the end, giving a history of the genesis of the manuscript. Its chief peculiarity consists in its containing seven Catholic epistles, while ordinary Syriac manuscripts have but three; 2 Peter, 2 and 3 John, and Jude being commonly rejected by the Syrians, and very rarely found among them. The version is Peshitto, except for these commonly rejected epistles, in which is followed the version usually printed. Each book, except the several Catholic epistles (and they as a whole), has its proemium from Gregory Bar Hebraeus, and its title and subscription. The manuscript is provided throughout with the Syrian sections and church lessons, and is dated at the end. Grammatical and other annotations occur frequently in the margins. The careful writing and pointing, as well as the superior character of the text, with the matters narrated in the poem at the end, show the work to be that of a critical Syrian scholar, and not of a mere copyist. Two notes by the contemporary corrector appear on leaves toward the end. The printed editions of the rejected epistles all rest on one inferior Bodleian manuscript, and particularly upon its *editio princeps*, published by Edward Pococke (Leyden, *Elzevir*) in 1630. This has hitherto been varied in later editions only by editorial conjecture. This is the second manuscript of these epistles ever given to the public, and doubles the available critical material, though a few other manuscripts of various ages are known to exist, some copied from the printed editions. The selected pages are: 1. A page containing the end of one of the tables of lessons, with a contemporary Arabic note respecting the origin and character of the manuscript; 2. The first page of Acts, with title and proemium, showing the general appearance and external characteristics of the manuscript; 3. The leaves which contain the Antilegomena matter,—2 Peter, 2 and 3 John, and Jude (with them, of course, the end of 1 Peter, 1 John, and the beginning of Romans, with general proemium to the Pauline epistles and that to Romans); 4. The last page of the manuscript proper, end and

subscription to Hebrews, and date of manuscript, with note of contemporary corrector; 5. Two pages containing the poem above referred to; in all, seventeen phototype pages, each on a separate leaf, besides additional pages containing appropriate descriptive and explanatory matter.

EDUCATIONAL BOOKS AND REPORTS.

A BATCH of educational pamphlets has been accumulating on our table, and we believe that a reference to their contents will be of interest to the readers of *Science*.

In the beautifully printed parchment series of Keagan Paul & Co., Lord Iddesleigh (Sir S. Northcote) has given a complete report of the entertaining lecture which he delivered as the first of a series of addresses to the students of the University of Edinburgh, Nov. 3, 1885. He discusses desultory reading, its pleasures, dangers, and uses. The theme is not new, but after Maurice, and Carlyle, and Lowell, and Emerson, and many more who have recorded their experience, these fresh statements on 'the friendship of books' are well worth reading. They suggested to the London *Spectator* of Jan. 2 a racy editorial, quite worth perusal.

The former cabinet-minister, Rt. Hon. G. J. Goschen, M.P., has collected seven of his addresses on educational and economical themes. That upon the cultivation of the imagination was reprinted long ago in Littell. The second, on mental training and useful knowledge, points out the danger of science-teaching; namely, that the teachers will endeavor to impart facts rather than to set the scholar thinking. The third, higher education for workmen, is an explanation of the purposes of the London society for the extension of university teaching, and an endeavor to awaken a love of study among bread-winners. The lecture is most encouraging in its account of the success of popular concerts and lectures in London. The rest of the volume relates to economics.

The University of Cambridge has published the report of a syndicate on popular lectures, written by Rev. W. M. Ede of St. John's college. It reviews the work of the university extension scheme, and points out the obstacles which that work has encountered, and the danger of its degenerating into a mere lecturing scheme. The tone of the report is encouraging, and its frank exhibition of the conditions of failure and of success makes it suggestive to Americans who are endeavoring by like methods to carry instruction to those classes in the community who are at hard work during many hours each day.

This is the period when most of the reports ap-

pear which are given to the public on the part of universities and colleges. Among those which have reached us, that of Columbia college may first be named, which is dated as far back as May 5. President Barnard discusses the working of the elective system, and says that the study which has commanded the preference of the largest number in the classes where there is freedom of choice is Greek, while mathematics commands the preference of the smaller number. It should be borne in mind that this refers to the academical or classical department, not to the School of mines, where those young men are most likely to go who are adverse to Greek and inclined to mathematics. Of those electing, one-half elect French, one-third German, and one-seventh Spanish. The library, which a short time ago was forty-seventh in magnitude among collections in the United States, is now twentieth, and connected with it there is a school for the education of librarians. The School of mines, in its new accommodations, is more useful than ever, but the tendency to overwork is so strong that the faculty are considering important modifications of the courses.

President Walker, of the Massachusetts institute of technology, shows that the number of students has increased from 302 in 1881-82, to 609 in 1885-86,—a truly wonderful advance. They come from thirty-three states, and their average age is eighteen years and two months. He exhibits the value of the system of receiving young men as 'special students,'—a practice which elsewhere has led to inconveniences and difficulties.

In the University of Michigan, President Angell expresses regret that there are less students than formerly from homes without that state, and justly says that the institution will suffer if its cosmopolitan character is lost. He strongly commends the working of the elective system, and makes a vigorous, and we hope an irresistible, appeal for continued liberality in the development of the university.

The annual report of the University of California is prepared by the secretary of the regents, J. H. C. Bonté; and while it contains all the information which can be desired, and much more than is commonly given, it indicates the lack of a coordinating mind. The new president, Prof. E. S. Holden, entered upon his duties after the report was issued, and the result of his oversight will be seen a year hence. The report indicates great generosity in the endowment of the university. Its funds for general purposes amount to \$1,678,386, besides the site, the buildings, and certain property not yet available, estimated at more than a million of dollars. In addition to all this, there

is the great Lick gift, for an observatory, and smaller endowments for medicine and law.

The full reports of Governor Stanford's gift indicate that his purposes are by no means so definite as were at first supposed, and it may be hoped that his mind is still open for suggestions which will tend toward important modifications in the original instrument.

Col. H. B. Sprague, late of Boston, has become president of Mills college for women, in California, and his inaugural address is a glowing review of the various subjects which tend to constitute a liberal education.

NEW BOOKS.

'HOUSEHOLD economy,' published under the direction of the Kitchen garden association (New York, *Iverson, Blakeman, Taylor & Co.*), is intended to supply a want long felt by almost every class of society, that of a clear, concise, and systematic text-book on those duties which "always have claimed, and probably always will claim, the main thought and time of the vast majority of women." — 'Food-materials and their adulterations,' by Ellen H. Richards (Boston, *Estes & Lauriat*), is a little work intended for the intelligent housewife. The author disclaims novelty or originality. In some places the work is too technical for the readers whom the author would reach, and, as in the analysis of milk, some errors have slipped in; nevertheless the work will serve a very useful purpose, containing as it does a description of the principal food-materials and their adulterations, and at times hints on their culinary preparation. — 'Nature's teaching,' by J. G. Wood (Boston, *Roberts*), is designed "to show the close connection between nature and human inventions, and that there is scarcely an invention of man that has not its prototype in nature." The author has there grouped a long series of parallels under the heads 'Nautical,' 'War and hunting,' 'Architecture,' 'Tools,' 'Optics,' 'Useful arts,' and 'Acoustics.' But often the merest resemblance of some natural growth to some human contrivance causes their association, when one has but the remotest connection with, or suggestiveness toward, the other. — 'A handbook to the national museum at Washington' (New York, *Brentano brothers*) will be a useful guide to the extensive scientific collections of the national museum now on exhibition. It is interspersed with a large number of engravings, mostly good, which, together with the numerous explanatory notes, will give the work an independent value. It was prepared by Mr. Ernest Ingersoll, whose pleasant literary style is well known.